

## Damage Adaptive Guidance for Piloted Upset Recovery, Phase I

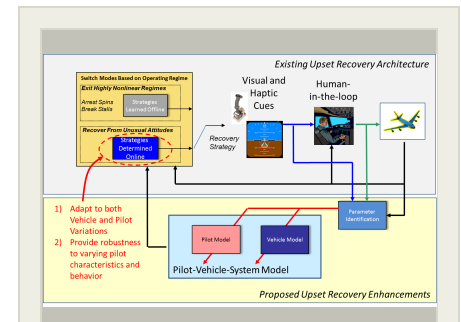
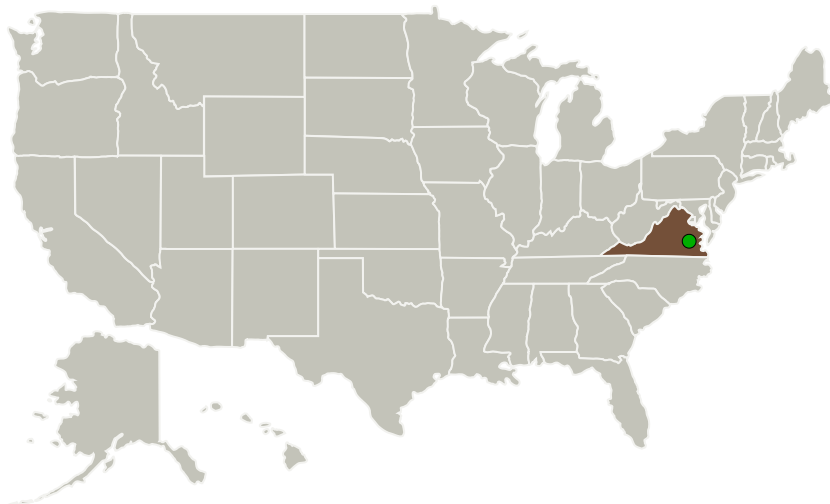


Completed Technology Project (2014 - 2014)

## Project Introduction

Aircraft Loss-Of-Control (LOC) has been a longstanding contributor to fatal aviation accidents. Inappropriate pilot action for healthy aircraft, control failures, and vehicle impairment are frequent contributors to LOC accidents. These accidents could be reduced if an on-board system was available to immediately guide the pilot to a safe flight condition (including cases of control failure or vehicle impairment). Barron Associates previously developed and demonstrated (in pilot-in-the-loop simulations) a system for finding appropriate control input sequences to recovery from upset conditions, and for cueing pilots to follow these sequences. The proposed work would add several innovative capabilities to the existing architecture. One of the most significant proposed enhancements is the addition of adaptation to address off-nominal vehicle responses. Off-nominal vehicle responses can occur for a number of reasons including adverse onboard conditions (e.g., actuator failures, engine failures, or airframe damage) and external hazards, especially icing. The addition of adaptation capabilities will allow the proposed system to provide appropriate upset recovery guidance in cases of off-nominal vehicle response. The proposed system is also specifically designed to be robust to variations in pilot dynamic behavior as well as provide enhanced robustness to pilot deviations from the recommended recovery strategies.

## Primary U.S. Work Locations and Key Partners



Damage Adaptive Guidance for Piloted Upset Recovery Project Image

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| Organizations Performing Work   | Role                    | Type        | Location                  |
|---------------------------------|-------------------------|-------------|---------------------------|
| Barron Associates, Inc.         | Lead Organization       | Industry    | Charlottesville, Virginia |
| ● Langley Research Center(LaRC) | Supporting Organization | NASA Center | Hampton, Virginia         |

## Primary U.S. Work Locations

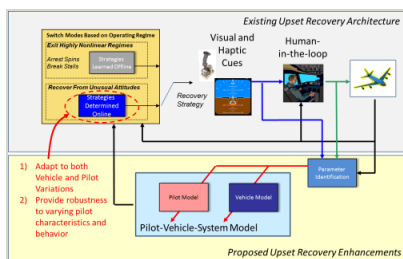
Virginia

## Project Transitions

**June 2014:** Project Start**December 2014:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/140493>)

## Images

**Project Image**

Damage Adaptive Guidance for  
Piloted Upset Recovery Project  
Image

(<https://techport.nasa.gov/image/133184>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission  
Directorate (STMD)

**Lead Organization:**

Barron Associates, Inc.

**Responsible Program:**

Small Business Innovation  
Research/Small Business Tech  
Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Richard Adams

**Co-Investigator:**

Nathan D Richards

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## Technology Maturity (TRL)

Start: **2**  
Current: **4**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX10 Autonomous Systems
  - └ TX10.2 Reasoning and Acting
    - └ TX10.2.6 Fault Response

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System